PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-206472
(43)Date of publication of application : 13.08.1996

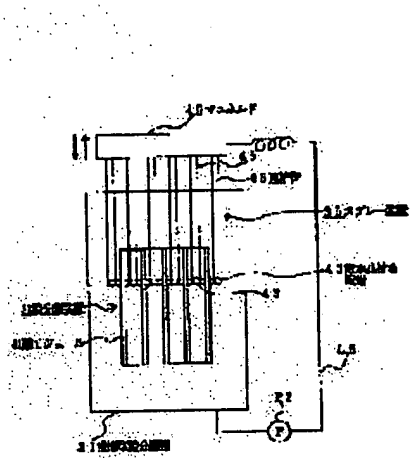
(51)Int.Cl. B01D 65/02

(21)Application number : 07-017023
(22)Date of filing : 03.02.1995

(71)Applicant : SUMITOMO HEAVY IND LTD
(72)Inventor : MIKI KOHEI
YASUMURA NOBUYUKI

(54) WASHING OF FILTER MEMBRANE

(57)Abstract:
PURPOSE: To easily and uniformly wash a membrane module without damaging a membrane or obstructing the flow of water to be treated.
CONSTITUTION: A membrane separator 32 is immersed in a treatment tank and treated water is separated from water to be treated by the membrane separator 32. The water to be treated in the treatment tank is discharged so as to leave a set amt. of water to be treated and the membrane module 41 of the membrane separator 32 is exposed to a gas phase. Next, the remaining water to be treated is taken out of the bottom part of the treatment tank to be supplied to a sprayer 35 and ejected to the membrane module 41 from the sprayer 35. Since the surface of a membrane is exposed to the gas phase, the momentum possessed by water to be treated can be allowed to directly act on the surface of the membrane. Therefore, the solid stuck to the surface of the membrane can be sufficiently peeled.



LEGAL STATUS

[Date of request for examination]	29.08.2001
[Date of sending the examiner's decision of rejection]	14.09.2004
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	
[Date of registration]	
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開平8－206472
(43)公開日　平成8年(1996)8月13日

(51)Int.Cl.⁶	識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ｂ０１Ｄ　65/02				

審査請求　未請求　請求項の数5　ＯＬ　（全７頁）

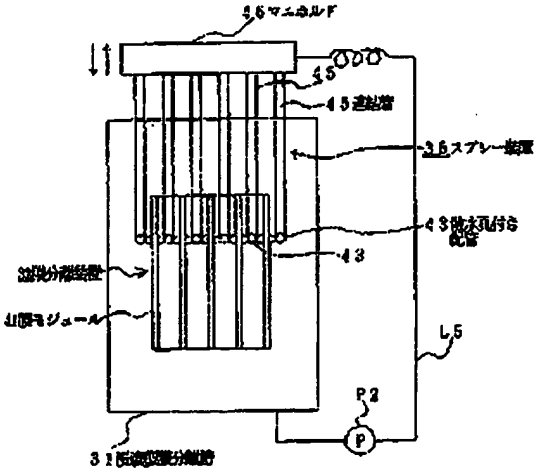
(21)出願番号　特願平7－17023

(22)出願日　平成7年(1995)2月3日

(71)出願人　000002107
住友重機械工業株式会社
東京都品川区北品川五丁目９番11号
(72)発明者　三木　康平
神奈川県平塚市夕陽ヶ丘63番30号　住友重機械工業株式会社総合技術研究所内
(72)発明者　安村　宣之
神奈川県平塚市夕陽ヶ丘63番30号　住友重機械工業株式会社総合技術研究所内
(74)代理人　弁理士　川合　誠　（外１名）

(54)【発明の名称】　ろ過膜洗浄方法

(57)【要約】
【目的】膜が破損したり、被処理水の流れを阻害したりすることなく、膜モジュールを容易にかつ一様に洗浄することができるようにする。
【構成】処理槽に膜分離装置３２を浸漬（しんせき）し、該膜分離装置３２によって被処理水から処理水を分離させる。処理槽内の被処理水を設定量だけ残留させて排出し、膜分離装置３２の膜モジュール４１を気相に露出させる。次に、残留した被処理水を処理槽の底部から取り出してスプレー装置３５に供給し、スプレー装置３５から膜モジュール４１に噴射する。膜面を気相に露出しているので、被処理水が有する運動量を直接膜面に作用させることができる。したがって、膜面に付着した固形物を十分に剥離（はくり）させることができる。



1

【特許請求の範囲】

【請求項1】　処理槽に膜分離装置を浸漬し、該膜分離装置によって被処理水から処理水を分離させる廃水処理装置のろ過膜洗浄方法において、（a）前記処理槽内の被処理水を設定量だけ残留させて排出し、前記膜分離装置の膜モジュールを気相に露出させ、（b）残留した被処理水を処理槽の底部から取り出してスプレー装置に供給し、該スプレー装置から膜モジュールに噴射することを特徴とするろ過膜洗浄方法。

【請求項2】　被処理水を膜モジュールに噴射する際に、前記スプレー装置が膜面に沿って昇降させられる請求項1に記載のろ過膜洗浄方法。

【請求項3】　被処理水を膜モジュールに噴射する際に、該膜モジュールが回転させられる請求項1に記載のろ過膜洗浄方法。

【請求項4】　（a）前記処理槽と生物処理水槽とが接続され、（b）該生物処理水槽から前記処理槽に被処理水が供給されるとともに、（c）前記処理槽から排出された被処理水が前記生物処理水槽に供給される請求項1に記載のろ過膜洗浄方法。

【請求項5】　（a）前記処理槽と凝集処理水槽とが接続され、（b）該凝集処理水槽から前記処理槽に被処理水が供給されるとともに、（c）前記処理槽から排出された被処理水が前記凝集処理水槽に供給される請求項1に記載のろ過膜洗浄方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、ろ過膜洗浄方法に関するものである。

【0002】

【従来の技術】従来、夾雑（きょうざつ）物、汚泥等を含む原水をろ過して清澄水（以下「処理水」という。）を得るために、精密ろ過膜、限外ろ過膜等の膜モジュールが使用される。この場合、浸漬（しんせき）型膜分離槽に被処理水を供給し、該被処理水に膜モジュールを浸漬して、膜モジュールの被処理水側を加圧するか、処理水側を減圧するかして、被処理水中の処理水だけ透過させるようになっている。

【0003】前記被処理水中の夾雑物、汚泥等は膜モジュールの表面（以下「膜面」という。）に残留する。そして、被処理水を繰り返し処理していると、残留した夾雑物、汚泥等が次第に膜面に固形物として付着し、ケーキ層を形成して膜モジュールの透過性能を低下させてしまう。そこで、各種の方法によって膜モジュールを洗浄し、膜面から固形物を除去するようにしている。

【0004】すなわち、膜モジュールの処理水側から被処理水側に空気を逆流させる空気逆洗法、被処理水内において膜面にスポンジボールを当てる方法、膜モジュールを浸漬型膜分離槽から取り出し、膜面に高圧の洗浄水をスプレーする方法等がある。図2は従来の空気逆洗法

2

を示す図である。

【0005】図において、11は浸漬型膜分離槽であり、ラインL1を介して被処理水が供給される。また、12は複数の平型の膜モジュール21から成り、浸漬型膜分離槽11に浸漬された膜分離装置であり、処理水側がポンプP1によって減圧される。前記膜分離装置12の下方には、散気装置13が配設される。該散気装置13にはブロア14が接続され、該ブロア14から吐出された空気がラインL2を介して散気管15に供給され、該散気管15から噴射される。そして、噴射された空気は浸漬型膜分離槽11内を上昇し、被処理水を巻き込んで循環させる。

【0006】前記膜分離装置12においては、膜モジュール21の処理水側が減圧されるので、各膜モジュール21間を上昇する被処理水中の処理水だけが膜を透過し、ラインL3を介して排出される。また、18はラインL4を介して各膜モジュール21に空気を供給するブロアであり、処理水側から被処理水側に圧縮された空気を逆流させることによって、膜面から固形物を除去する。なお、各ラインL2～L4にはバルブ22～24がそれぞれ配設され、必要に応じて開閉される。

【0007】

【発明が解決しようとする課題】しかしながら、前記従来のろ過膜洗浄方法においては、活性汚泥を用いた生物処理において膜モジュールを使用したり、凝集剤を添加した後の凝集処理において膜モジュールを使用したりすると、処理水側を減圧する低圧ろ過法を使用した場合でも、膜面に付着した固形物の付着力が大きく、固形物を容易に除去することはできない。

【0008】また、図2に示す空気逆洗法では処理水側に圧縮された空気が供給されるので、膜が膨張し、洗浄が頻繁に行われると、膜の支持部において破損することがある。そして、被処理水内において膜面にスポンジボールを当てる方法では、チューブラ型の膜モジュールに適用すると効果的であるが、平型の膜モジュールに適用した場合、膜モジュールを10～30〔mm〕程度の間隔で複数枚積層する必要があるので、被処理水の流れを阻害するとともに、各膜モジュール間（以下「膜間」という。）においてスポンジボールを均一に分散させることが困難であり、膜モジュールを一様に洗浄することができない。

【0009】さらに、膜モジュールを浸漬型膜分離槽から取り出し、膜面に高圧の洗浄水をスプレーする方法では、膜モジュールを浸漬型膜分離槽に対して着脱する作業が煩わしいだけでなく、除去された固形物を含む洗浄水を処理する必要が生じる。本発明は、前記従来のろ過膜洗浄方法の問題点を解決して、膜が破損したり、被処理水の流れを阻害したりすることなく、膜モジュールを容易にかつ一様に洗浄することができるろ過膜洗浄方法を提供することを目的とする。

【００１０】

【課題を解決するための手段】そのために、本発明のろ過膜洗浄方法においては、処理槽に膜分離装置を浸漬し、該膜分離装置によって被処理水から処理水を分離させるようになっている。そして、前記処理槽内の被処理水を設定量だけ残留させて排出し、前記膜分離装置の膜モジュールを気相に露出させる。次に、残留した被処理水を処理槽の底部から取り出してスプレー装置に供給し、該スプレー装置から膜モジュールに噴射する。

【００１１】本発明の他のろ過膜洗浄方法においては、被処理水を膜モジュールに噴射する際に、前記スプレー装置が膜面に沿って昇降させられる。本発明の更に他のろ過膜洗浄方法においては、被処理水を膜モジュールに噴射する際に、該膜モジュールが回転させられる。本発明の更に他のろ過膜洗浄方法においては、前記処理槽と生物処理水槽とが接続され、該生物処理水槽から前記処理槽に被処理水が供給されるとともに、前記処理槽から排出された被処理水が前記生物処理水槽に供給される。

【００１２】本発明の更に他のろ過膜洗浄方法においては、前記処理槽と凝集処理水槽とが接続され、該凝集処理水槽から前記処理槽に被処理水が供給されるとともに、前記処理槽から排出された被処理水が前記凝集処理水槽に供給される。

【００１３】

【作用】本発明によれば、前記のようにろ過膜洗浄方法においては、処理槽に膜分離装置を浸漬し、該膜分離装置によって被処理水から処理水を分離させるようになっている。そして、前記処理槽内の被処理水を設定量だけ残留させて排出し、前記膜分離装置の膜モジュールを気相に露出させる。次に、残留した被処理水を処理槽の底部から取り出してスプレー装置に供給し、該スプレー装置から膜モジュールに噴射する。

【００１４】この場合、被処理水を膜モジュールに噴射する際、膜面を気相に露出させるようになっているので、被処理水が有する運動量を直接膜面に作用させることができる。本発明の他のろ過膜洗浄方法においては、被処理水を膜モジュールに噴射する際に、前記スプレー装置が膜面に沿って昇降させられる。この場合、噴射された被処理水が膜モジュールの全体に当てられる。

【００１５】本発明の更に他のろ過膜洗浄方法においては、被処理水を膜モジュールに噴射する際に、該膜モジュールが回転させられる。この場合、噴射された被処理水が膜モジュールの全体に当てられる。本発明の更に他のろ過膜洗浄方法においては、前記処理槽と生物処理水槽とが接続され、該生物処理水槽から前記処理槽に被処理水が供給されるとともに、前記処理槽から排出された被処理水が前記生物処理水槽に供給される。この場合、生物処理が終了した被処理水から処理水を分離させることができる。

【００１６】本発明の更に他のろ過膜洗浄方法においては、前記処理槽と凝集処理水槽とが接続され、該凝集処理水槽から前記処理槽に被処理水が供給されるとともに、前記処理槽から排出された被処理水が前記凝集処理水槽に供給される。この場合、凝集処理が終了した被処理水から処理水を分離させることができる。

【００１７】

【実施例】以下、本発明の実施例について図面を参照しながら詳細に説明する。図３は本発明の第１の実施例におけるろ過膜洗浄装置の概念図である。図において、３１は処理槽としての浸漬型膜分離槽であり、ラインＬ１を介して被処理水が供給される。また、３２は複数の平型の図示しない膜モジュールから成り、浸漬型膜分離槽３１に浸漬された膜分離装置であり、被処理水中の処理水だけが膜モジュールの膜を透過して処理水側に送られる。

【００１８】また、３３は前記浸漬型膜分離槽３１の底部に形成された水抜管であり、該水抜管３３に配設された図示しないバルブを操作することによって、浸漬型膜分離槽３１内の被処理水を排出することができる。前記膜分離装置３２の各膜モジュールに対応させてスプレー装置３５が配設され、該スプレー装置３５と浸漬型膜分離槽３１の底部とがラインＬ５によって接続される。該ラインＬ５にはポンプＰ２が配設され、該ポンプＰ２によって底部の被処理水が循環させられ、スプレー装置３５から膜モジュールに噴射される。

【００１９】次に、前記構成のろ過膜洗浄装置の動作について説明する。まず、ラインＬ１を介して浸漬型膜分離槽３１に被処理水を供給し、ろ過処理を開始する。該ろ過処理において、被処理水中の処理水だけが膜モジュールの膜を透過して処理水側に送られ、夾雑物、汚泥等は膜面に残留する。そして、被処理水を繰り返し処理していると、残留した夾雑物、汚泥等が次第に膜面に固形物として付着し、ケーキ層を形成する。

【００２０】そこで、膜モジュール３２によって得られた処理水が必要量を下まわったときに、被処理水の供給を停止させ、ろ過膜洗浄処理を開始する。すなわち、前記バルブを操作して水抜管３３を介して浸漬型膜分離槽３１内の被処理水を排出し、膜分離装置３２の膜面を気相に露出させる。このとき、スプレー用水として浸漬型膜分離槽３１内の被処理水を一定量残す。

【００２１】そして、ポンプＰ２を作動させ、底部の被処理水をラインＬ５を介して循環させ、スプレー装置３５から膜モジュールに高圧で噴射する。被処理水を一定時間噴射した後、浸漬型膜分離槽３１に被処理水を再び供給し、該被処理水が設定された水位に達すると、ろ過処理を再開する。この場合、前記被処理水を膜モジュールに噴射する際、膜面を気相に露出させるようになっているので、被処理水が有する運動量を直接膜面に作用させることができる。したがって、被処理水が膜面に当たったときの衝撃力は大きく、膜面に付着した固形物を十

分に剥離（はくり）させることができる。その結果、固形物を容易に除去することができる。

【００２２】また、被処理水を洗浄用として使用するので、別の洗浄水を使用する必要がないだけでなく、除去された固形物を含む洗浄水を処理する必要もないので、コストを低くすることができる。そして、圧縮された空気を使用しないので、膜が破損されることがなく、スポンジボールを使用しないので、膜モジュールを一様に洗浄することができ、さらに、該膜モジュールを浸漬型膜分離槽から取り出す必要がないので、作業が簡素化される。

【００２３】次に、膜分離装置３２及びスプレー装置３５について詳細に説明する。図１は本発明の実施例におけるろ過膜洗浄装置の詳細図である。図において、３１は浸漬型膜分離槽であり、該浸漬型膜分離槽３１に膜分離装置３２が浸漬される。該膜分離装置３２は、矩形（くけい）形状の膜モジュール４１を所定間隔を置いて複数枚積層することによって形成される。

【００２４】また、前記膜分離装置３２の各膜モジュール４１に対応させてスプレー装置３５が配設される。該スプレー装置３５は複数の散水孔付き配管４３から成り、該散水孔付き配管４３は、各膜モジュール４１間及び最も外側の膜モジュール４１に隣接する位置に配設される。各散水孔付き配管４３には図示しない散水孔が形成され、該散水孔から被処理水が噴射される。

【００２５】前記散水孔付き配管４３は、前記膜モジュール４１の膜幅に相当する長さを有し、水平に配設される。そして、各散水孔付き配管４３には垂直に延びる連結管４５が接続され、該連結管４５の上端には共通のマニホルド４６が接続される。一方、該マニホルド４６と浸漬型膜分離槽３１の底部とがラインＬ５によって接続される。該ラインＬ５にはポンプＰ２が配設され、底部の被処理水が循環させられ、マニホルド４６及び連結管４５を介して散水孔付き配管４３に供給され、該散水孔付き配管４３の散水孔から膜モジュール４１に噴射される。

【００２６】ところで、前記マニホルド４６は図示しない駆動機構によって、矢印方向に昇降させることができるようになっているので、散水孔付き配管４３を膜モジュール４１に沿って昇降させ、被処理水を膜面の全体に当てることができる。例えば、被処理水の噴射を開始するとともに、散水孔付き配管４３を下降させ、該散水孔付き配管４３が膜モジュール４１の下端に達すると、散水孔付き配管４３を上昇させる。そして、散水孔付き配管４３の昇降を複数回又は一定時間継続する。ろ過膜洗浄処理が終了した後は、ろ過処理における被処理水の流動を妨げないように、前記散水孔付き配管４３を膜モジュール４１の上端より上方に移動させておく。

【００２７】このようにして、散水孔付き配管４３を昇降させることができるので、膜モジュール４１の膜面を

一様に洗浄することができる。次に、本発明の第２の実施例について説明する。図４は本発明の第２の実施例におけるろ過膜洗浄装置の詳細図である。図において、３１は処理槽としての浸漬型膜分離槽であり、該浸漬型膜分離槽３１に膜分離装置５２が浸漬される。該膜分離装置５２は、ディスク形状の膜モジュール５３を所定間隔を置いて複数枚積層し、軸５４によって回転自在に支持することによって形成される。

【００２８】また、前記膜分離装置５２の各膜モジュール５３に対応させてスプレー装置５５が配設される。該スプレー装置５５は複数の散水孔付き配管５６から成り、該散水孔付き配管５６は各膜モジュール５３間及び最も外側の膜モジュール５３に隣接する位置に配設される。各散水孔付き配管５６には、図示しない散水孔が形成され、該散水孔から被処理水が噴射される。この場合、前記散水孔は、散水孔付き配管５６の下部の膜モジュール５３の半径相当の長さにわたって形成される。そして、前記散水孔付き配管５６の上端には共通のマニホルド５７が接続される。ところで、前記膜モジュール５３は図示しない駆動機構によって回転させることができるようになっているので、被処理水を膜面の全体に当てることができる。

【００２９】一方、前記マニホルド５７と浸漬型膜分離槽３１の底部とがラインＬ５によって接続される。該ラインＬ５にはポンプＰ２が配設され、底部の被処理水が循環させられ、マニホルド５７を介して散水孔付き配管５６に供給され、該散水孔付き配管５６の散水孔から膜モジュール５３に噴射される。この場合、散水孔付き配管５６は固定されているが、膜モジュール５３が回転させられるので、該膜モジュール５３の膜面を一様に洗浄することができる。

【００３０】次に、本発明の第３の実施例について説明する。図５は本発明の第３の実施例におけるろ過膜洗浄装置の概念図である。この場合、高負荷の生物処理を行う工程においてろ過膜洗浄装置が使用される。そのために、生物処理水槽６１と処理槽としての浸漬型膜分離槽３１とをラインＬ１及び水抜管３３によって接続し、生物処理水槽６１において生物処理を行い、浸漬型膜分離槽３１においてろ過処理及びろ過膜洗浄処理を行う。該ろ過膜洗浄処理において、ポンプＰ２が作動させられ、浸漬型膜分離槽３１の底部の被処理水がラインＬ５を介してスプレー装置３５に供給され、該スプレー装置３５から膜分離装置３２の膜モジュール４１（図１）に噴射される。そして、ろ過処理において被処理水から処理水（生物処理水）が分離させられるのに伴い、被処理水が濃縮され、該被処理水が水抜管３３を介して生物処理水槽６１に返送される。したがって、該生物処理水槽６１内において高い菌体濃度を維持することができる。なお、Ｌ６は被処理水の原水供給ライン、Ｌ７はろ過時において被処理水の一部を引き抜くためのラインである。

【００３１】ところで、前記スプレー装置３５によって被処理水を膜モジュール４１に噴射するに当たり、膜面を気相に露出させるために、水抜管３３を介して浸漬型膜分離槽３１内の被処理水が排出される。この場合、水抜管３３は生物処理水槽６１と接続され、排出された被処理水は生物処理水槽６１に供給される。そこで、生物処理水槽６１には、浸漬型膜分離水槽３１の抜水量分の空容積を確保しておく必要がある。また、排出された被処理水を生物処理水槽６１に供給するために、水抜管３３にポンプＰ３が配設される。

【００３２】次に、前記構成のろ過膜洗浄装置の動作について説明する。まず、ラインＬ１を介して生物処理水槽６１から浸漬型膜分離槽３１に被処理水を供給し、ろ過処理を開始する。該ろ過処理において、被処理水中の処理水だけが膜モジュール４１の膜を透過して処理水側に送られ、夾雑物、汚泥等は膜面に残留する。そして、被処理水を繰り返し処理していると、残留した夾雑物、汚泥等が次第に膜面に固形物として付着し、ケーキ層を形成する。

【００３３】そこで、膜モジュール４１によって得られた処理水が必要量を下まわったときに、被処理水の供給を停止させ、ろ過膜洗浄処理を開始する。すなわち、前記ポンプＰ３を作動させて水抜管３３を介して浸漬型膜分離槽３１内の被処理水を排出し、生物処理水槽６１に供給する。そして、膜分離装置３２の膜面を気相に露出させる。このとき、スプレー用水として浸漬型膜分離槽３１内の被処理水を一定量残す。

【００３４】そして、ポンプＰ２を作動させ、浸漬型膜分離槽３１の底部の被処理水をラインＬ５を介して循環させ、スプレー装置３５から膜モジュール４１に高圧で噴射する。被処理水を一定時間噴射した後、ポンプＰ２を停止させ、浸漬型膜分離槽３１に被処理水を再び供給し、該被処理水が設定された水位に達すると、ろ過処理を再開する。

【００３５】次に、本発明の第４の実施例について説明する。図６は本発明の第４の実施例におけるろ過膜洗浄装置の概念図である。この場合、被処理水に塩化第二鉄等の凝集剤を添加して溶解性ＣＯＤ成分等を除去する凝集工程においてろ過膜洗浄装置が使用される。そのために、凝集処理水槽６２と処理槽としての浸漬型膜分離槽３１とをラインＬ１及び水抜管３３によって接続し、前記凝集処理水槽６２において凝集処理を行い、浸漬型膜分離槽３１においてろ過処理及びろ過膜洗浄処理を行う。なお、Ｌ６は被処理水の原水供給ライン、Ｌ７はろ過時において被処理水の一部を引き抜くためのラインである。

【００３６】前記ろ過処理において被処理水から処理水が分離させられる。また、ろ過膜洗浄処理においてポンプＰ２が作動させられ、浸漬型膜分離槽３１の底部の被処理水がラインＬ５を介してスプレー装置３５に供給され、該スプレー装置３５から膜分離装置３２の膜モジュール４１（図１）に噴射される。その結果、ろ過処理において膜面に残留した懸濁物質を除去することができる。

【００３７】ところで、前記スプレー装置３５によって被処理水を膜モジュール４１に噴射するに当たり、膜面を気相に露出させるために、水抜管３３を介して浸漬型膜分離槽３１内の被処理水が排出される。この場合、水抜管３３は凝集処理水槽６２に接続され、排出された被処理水は凝集処理水槽６２に供給される。そこで、該凝集処理水槽６２には、浸漬型膜分離水槽３１の抜水量分の空容積を確保しておく必要がある。また、排出された被処理水を凝集処理水槽６２に供給するために、水抜管３３にポンプＰ３が配設される。

【００３８】なお、本発明は前記実施例に限定されるものではなく、本発明の趣旨に基づいて種々変形させることが可能であり、これらを本発明の範囲から排除するものではない。

【００３９】

【発明の効果】以上詳細に説明したように、本発明によれば、ろ過膜洗浄方法においては、処理槽に膜分離装置を浸漬し、該膜分離装置によって被処理水から処理水を分離させるようになっている。そして、前記処理槽内の被処理水を設定量だけ残留させて排出し、前記膜分離装置の膜モジュールを気相に露出させる。次に、残留した被処理水を処理槽の底部から取り出してスプレー装置に供給し、該スプレー装置から膜モジュールに噴射する。

【００４０】この場合、被処理水を膜モジュールに噴射する際、膜面を気相に露出させるようになっているので、被処理水が有する運動量を直接膜面に作用させることができる。したがって、被処理水が膜面に当たったときの衝撃力は大きく、膜面に付着した固形物を十分に剥離させることができる。その結果、固形物を容易に除去することができる。

【００４１】また、被処理水を洗浄用として使用するので、別の洗浄水を使用する必要がないだけでなく、除去された固形物を含む洗浄水を処理する必要もないので、コストを低くすることができる。そして、圧縮された空気を使用しないので、膜が破損することがなく、スポンジボールを使用しないので、膜モジュールを一様に洗浄することができ、さらに、該膜モジュールを処理槽から取り出す必要がないので、作業が簡素化される。

【００４２】本発明の他のろ過膜洗浄方法においては、被処理水を膜モジュールに噴射する際に、前記スプレー装置が膜面に沿って昇降させられる。この場合、噴射された被処理水が膜モジュールの全体に当てられる。したがって、該膜モジュールの膜面を一様に洗浄することができる。本発明の更に他のろ過膜洗浄方法においては、被処理水を膜モジュールに噴射する際に、該膜モジュールが回転させられる。この場合、噴射された被処理水が

膜モジュールの全体に当てられる。したがって、該膜モジュールの膜面を一様に洗浄することができる。

【0043】本発明の更に他のろ過膜洗浄方法においては、前記処理槽と生物処理水槽とが接続され、該生物処理水槽から前記処理槽に被処理水が供給されるとともに、前記処理槽から排出された被処理水が前記生物処理水槽に供給される。この場合、生物処理が終了した被処理水から処理水を分離させることができる。したがって、濃縮された被処理水を生物処理水槽に返送することができるので、生物処理水槽内において高い菌体濃度を維持することができる。

【図面の簡単な説明】

【図1】本発明の実施例におけるろ過膜洗浄装置の詳細図である。

【図2】従来の空気逆洗法を示す図である。

＊【図3】本発明の第1の実施例におけるろ過膜洗浄装置の概念図である。

【図4】本発明の第2の実施例におけるろ過膜洗浄装置の詳細図である。

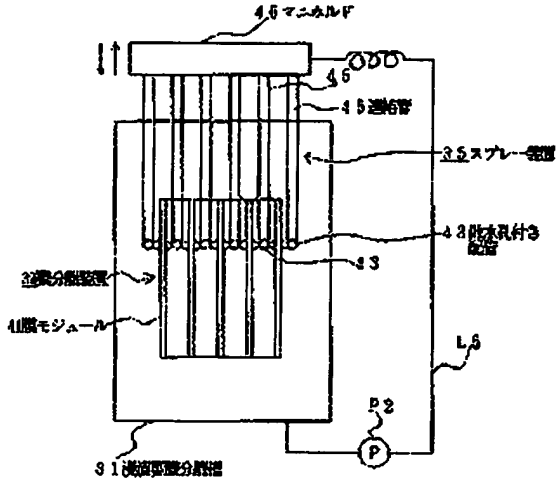
【図5】本発明の第3の実施例におけるろ過膜洗浄装置の概念図である。

【図6】本発明の第4の実施例におけるろ過膜洗浄装置の概念図である。

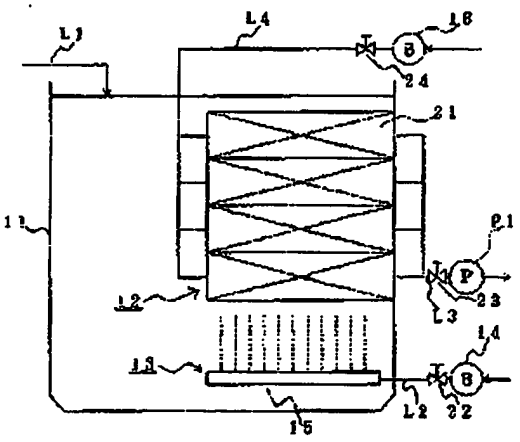
【符号の説明】

31　浸漬型膜分離槽
32．52　膜分離装置
35．55　スプレー装置
41．53　膜モジュール
61　生物処理水槽
62　凝集処理水槽

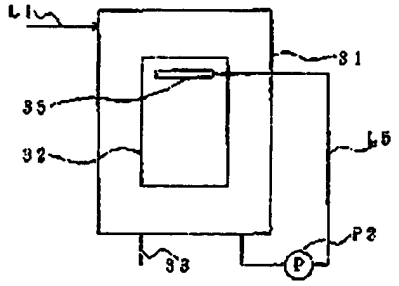
【図1】



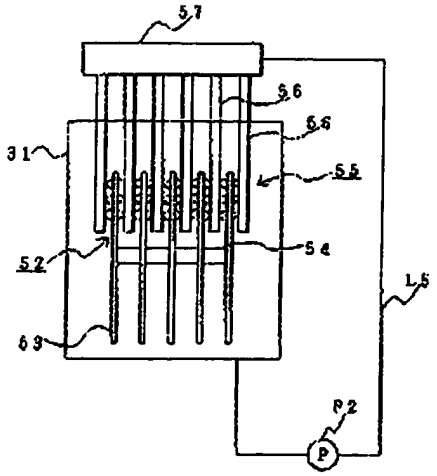
【図2】



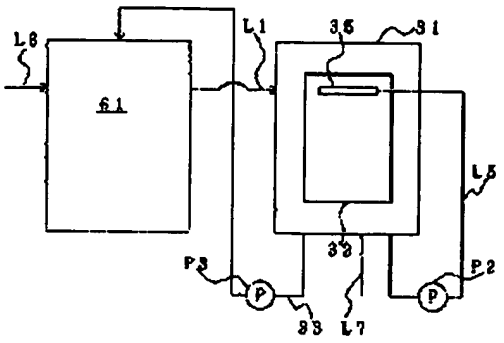
【図3】



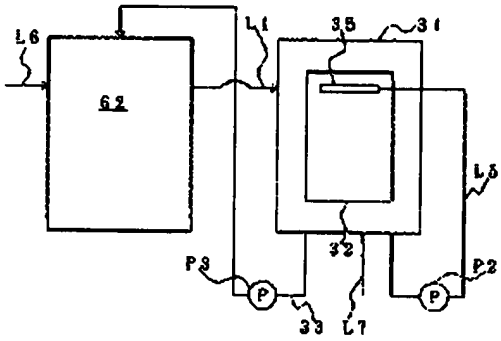
【図4】



【図5】



【図6】



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the filtration film washing approach.
[0002]
[Description of the Prior Art] In order to filter the raw water containing a contamination (today ****) object, sludge, etc. and to obtain clarified water (henceforth "treated water") conventionally, membrane modules, such as a membrane filter and ultrafiltration membrane, are used. In this case, processed water is supplied to an immersion (**** weir) mold membrane-separation tub, a membrane module is immersed in this processed water, and only processed underwater treated water is made to penetrate by pressurizing the processed water side of a membrane module, or decompressing a treated water side.
[0003] Said processed underwater impurity, sludge, etc. remain on the surface of a membrane module (henceforth a "film surface"). And if processed water is repeated and processed, impurity, sludge, etc. which remained will adhere to a film surface as solids gradually, a cake layer will be formed, and the penetrable ability of a membrane module will be reduced. Then, he washes a membrane module and is trying to remove a solid from a film surface by various kinds of approaches.
[0004] That is, the air back wash method make air flow backwards from the treated water side of a membrane module to a processed water side, the approach of applying a sponge ball to a film surface in processed Mizuuchi, and a membrane module are taken out from a dipping former membrane-separation tub, and there is the approach of carrying out the spray of the high-pressure wash water to a film surface etc. Drawing 2 is drawing showing the conventional air back wash method.
[0005] In drawing, 11 is a dipping former membrane-separation tub, and processed water is supplied through Rhine L1. Moreover, 12 consists of the membrane module 21 of two or more flat tips, it is the membrane separation device immersed in the dipping former membrane-separation tub 11, and a treated water side is decompressed with a pump P1. A diffuser 13 is arranged under said membrane separation device 12. Blois 14 is connected to this diffuser 13, and the air breathed out from this Blois 14 is supplied to the powder trachea 15 through Rhine L2, and is injected from this powder trachea 15. And the injected air goes up the inside of the dipping former membrane-separation tub 11, and involves in and circulates processed water.
[0006] In said membrane separation device 12, since the treated water side of a membrane module 21 is decompressed, only the processed underwater treated water which goes up between each membrane module 21 penetrates the film, and is discharged through Rhine L3. Moreover, 18 is Blois which supplies air to each membrane module 21 through Rhine L4, and removes a solid from a film surface by making the air compressed into the processed water side from the treated water side flow backwards. In addition, bulbs 22-24 are arranged by each Rhine L2-L4, respectively, and are opened if needed and closed.
[0007]
[Problem(s) to be Solved by the Invention] However, in said conventional filtration film washing approach, even when a membrane module is used, or the membrane module was used in the coagulation treatment after adding a flocculant in the biological treatment using active sludge and the low voltage filtration which decompresses a treated water side is used, the adhesion force of the solid adhering to a film surface is large, and cannot remove a solid easily.
[0008] Moreover, since the air compressed into the treated water side by the air back wash method shown in drawing 2 is supplied, when the film expands and washing is performed frequently, it may damage in a membranous supporter. And by the approach of applying a sponge ball to a film surface in processed Mizuuchi, although it is effective if it applies to the membrane module of a tubular mold While checking the flow of processed water since it is necessary to carry out two or more sheet laminating of the membrane module at intervals of 10-30 [mm] extent when it applies to the membrane module of a flat tip, it is between each membrane module (it is called "between film" below.). It is difficult to set and to make homogeneity distribute a sponge ball, and it cannot wash a membrane module uniformly.
[0009] Furthermore, it will be necessary to take out a membrane module from a dipping former membrane-separation tub, and to process the wash water with which the activity which detaches and attaches a membrane module to a dipping former membrane-separation tub contains the solid it is not only troublesome, but removed by the approach of carrying out the spray of the high-pressure wash water to a film surface. This invention aims at offering the filtration film washing approach which can wash a membrane module easily and uniformly, without solving the trouble of said conventional filtration film washing approach, damaging the film or checking the flow of processed water.
[0010]
[Means for Solving the Problem] Therefore, a membrane separation device is immersed in a processing tub, and this membrane separation device is made to separate treated water from processed water in the filtration film washing approach of this invention. And only the amount of setup is made to remain, the processed water in said processing tub is discharged, and the membrane module of said membrane separation device is exposed to a gaseous phase. Next, the processed water which remained is taken out from the pars basilaris ossis occipitalis of a processing tub, spray equipment is supplied, and it injects from this spray equipment to a membrane module.
[0011] In case processed water is injected to a membrane module, said spray equipment is made to go up and down along with a film surface in other filtration film washing approaches of this invention. In the filtration film washing approach of further others of this invention, in case processed water is injected to a membrane module, this membrane module is rotated. In the filtration film washing approach of further others of this invention, while said processing tub and biological treatment tank are connected and processed water is supplied to said processing tub from this biological treatment tank, the processed water discharged from said processing tub is supplied to said biological treatment tank.
[0012] In the filtration film washing approach of further others of this invention, while said processing tub and a condensation treated water tub are

connected and processed water is supplied to said processing tub from this condensation treated water tub, the processed water discharged from said processing tub is supplied to said condensation treated water tub.

[0013]

[Function] According to this invention, a membrane separation device is immersed in a processing tub, and this membrane separation device is made to separate treated water from processed water in the filtration film washing approach as mentioned above. And only the amount of setup is made to remain, the processed water in said processing tub is discharged, and the membrane module of said membrane separation device is exposed to a gaseous phase. Next, the processed water which remained is taken out from the pars basilaris ossis occipitalis of a processing tub, spray equipment is supplied, and it injects from this spray equipment to a membrane module.

[0014] In this case, since a film surface is exposed to a gaseous phase in case processed water is injected to a membrane module, the momentum which processed water has can be made to act on a direct film surface. In case processed water is injected to a membrane module, said spray equipment is made to go up and down along with a film surface in other filtration film washing approaches of this invention. In this case, the injected processed water is applied by the whole membrane module.

[0015] In the filtration film washing approach of further others of this invention, in case processed water is injected to a membrane module, this membrane module is rotated. In this case, the injected processed water is applied by the whole membrane module. In the filtration film washing approach of further others of this invention, while said processing tub and biological treatment tank are connected and processed water is supplied to said processing tub from this biological treatment tank, the processed water discharged from said processing tub is supplied to said biological treatment tank. In this case, treated water can be made to separate from the processed water which biological treatment ended.

[0016] In the filtration film washing approach of further others of this invention, while said processing tub and a condensation treated water tub are connected and processed water is supplied to said processing tub from this condensation treated water tub, the processed water discharged from said processing tub is supplied to said condensation treated water tub. In this case, treated water can be made to separate from the processed water which the coagulation treatment ended.

[0017]

[Example] Hereafter, it explains to a detail, referring to a drawing about the example of this invention. Drawing 3 is the conceptual diagram of the filtration film washing station in the 1st example of this invention. In drawing, 31 is a dipping former membrane-separation tub as a processing tub, and processed water is supplied through Rhine L1. Moreover, 32 consists of the membrane module which two or more flat tips do not illustrate, and it is the membrane separation device immersed in the dipping former membrane-separation tub 31, and only processed underwater treated water penetrates the film of a membrane module, and it is sent to a treated water side.

[0018] Moreover, 33 is the water extubation formed in the pars basilaris ossis occipitalis of said dipping former membrane-separation tub 31, and can discharge the processed water in the dipping former membrane-separation tub 31 by operating the bulb which was arranged in this water extubation 33 and which is not illustrated. Each membrane module of said membrane separation device 32 is made to correspond, spray equipment 35 is arranged, and this spray equipment 35 and the pars basilaris ossis occipitalis of the dipping former membrane-separation tub 31 are connected by Rhine L5. A pump P2 is arranged in this Rhine L5, and with this pump P2, the processed water of a pars basilaris ossis occipitalis is circulated, and it is injected by the membrane module from spray equipment 35.

[0019] Next, actuation of the filtration film washing station of said configuration is explained. First, processed water is supplied to the dipping former membrane-separation tub 31 through Rhine L1, and filtration processing is started. In this filtration processing, only processed underwater treated water penetrates the film of a membrane module, and is sent to a treated water side, and impurity, sludge, etc. remain to a film surface. And if processed water is repeated and processed, impurity, sludge, etc. which remained will adhere to a film surface as solids gradually, and will form a cake layer.

[0020] Then, when the treated water obtained with the membrane module 32 turns around an initial complement the bottom, supply of processed water is stopped and filtration film washing processing is started. That is, said bulb is operated, the processed water in the dipping former membrane-separation tub 31 is discharged through the water extubation 33, and the film surface of a membrane separation device 32 is exposed to a gaseous phase. this time -- a spray -- as service water -- the processed water in the dipping former membrane-separation tub 31 -- constant-rate ****.

[0021] And a pump P2 is operated, the processed water of a pars basilaris ossis occipitalis is circulated through Rhine L5, and it injects from spray equipment 35 with high pressure to a membrane module. After carrying out fixed time amount injection of the processed water, processed water is again supplied to the dipping former membrane-separation tub 31, and filtration processing will be resumed if the water level to which this processed water was set is reached. In this case, since a film surface is exposed to a gaseous phase in case said processed water is injected to a membrane module, the momentum which processed water has can be made to act on a direct film surface. Therefore, the solid which was large as for impulse force when processed water hits a film surface, and adhered to the film surface can be made to fully exfoliate (** to vomit). Consequently, a solid is easily removable.

[0022] Moreover, since it is not necessary to process the wash water which it is not necessary not only to use another wash water, but contains the removed solid since processed water is used as an object for washing, cost can be made low. And since the film is not damaged since the compressed air is not used, and a sponge ball is not used, a membrane module can be washed uniformly, and further, since it is not necessary to take out this membrane module from a dipping former membrane-separation tub, an activity is simplified.

[0023] Next, a membrane separation device 32 and spray equipment 35 are explained to a detail. Drawing 1 is the detail drawing of the filtration film washing station in the example of this invention. In drawing, 31 is a dipping former membrane-separation tub, and it is immersed in this dipping former membrane-separation tub 31 in a membrane separation device 32. This membrane separation device 32 is formed by placing the membrane module 41 of a rectangle (******) configuration, and carrying out two or more sheet laminating of the predetermined spacing.

[0024] Moreover, each membrane module 41 of said membrane separation device 32 is made to correspond, and spray equipment 35 is arranged. This spray equipment 35 consists of two or more piping 43 with a water spray hole, and this piping 43 with a water spray hole is arranged in the location contiguous to the outermost membrane module 41 between each membrane module 41. The water spray hole which is not illustrated is formed in each piping 43 with a water spray hole, and processed water is injected from this water spray hole.

[0025] Said piping 43 with a water spray hole has the die length equivalent to the film width of said membrane module 41, and is arranged horizontally. And the interconnecting tube 45 prolonged at right angles to each piping 43 with a water spray hole is connected, and the common manifold 46 is connected to the upper limit of this interconnecting tube 45. On the other hand, this manifold 46 and the pars basilaris ossis occipitalis of the dipping former membrane-separation tub 31 are connected by Rhine L5. A pump P2 is arranged in this Rhine L5, the processed water of a pars basilaris ossis occipitalis is circulated, the piping 43 with a water spray hole is supplied through a manifold 46 and an interconnecting tube 45, and it is injected by the membrane module 41 from the water spray hole of this piping 43 with a water spray hole.

[0026] By the way, with the drive which is not illustrated, since you can make it go up and down in the direction of an arrow head now, said

manifold 46 can make it able to go up and down the piping 43 with a water spray hole along with a membrane module 41, and can apply processed water to the whole film surface. For example, if the piping 43 with a water spray hole is dropped and this piping 43 with a water spray hole arrives at the lower limit of a membrane module 41 while starting injection of processed water, the piping 43 with a water spray hole will be raised. And rise and fall of the piping 43 with a water spray hole are continued during multiple times or 1 scheduled time. After filtration film washing processing is completed, said piping 43 with a water spray hole is moved more nearly up than the upper limit of a membrane module 41 so that a flow of the processed water in filtration processing may not be barred.

[0027] Thus, since you can make it go up and down the piping 43 with a water spray hole, the film surface of a membrane module 41 can be washed uniformly. Next, the 2nd example of this invention is explained. Drawing 4 is the detail drawing of the filtration film washing station in the 2nd example of this invention. In drawing, 31 is a dipping former membrane-separation tub as a processing tub, and it is immersed in this dipping former membrane-separation tub 31 in a membrane separation device 52. This membrane separation device 52 keeps predetermined spacing for the membrane module 53 of a disk configuration, carries out two or more sheet laminating, and is formed by supporting free [rotation] with a shaft 54.

[0028] Moreover, each membrane module 53 of said membrane separation device 52 is made to correspond, and spray equipment 55 is arranged. This spray equipment 55 consists of two or more piping 56 with a water spray hole, and this piping 56 with a water spray hole is arranged in the location contiguous to the outermost membrane module 53 between each membrane module 53. The water spray hole which is not illustrated is formed in each piping 56 with a water spray hole, and processed water is injected from this water spray hole. In this case, said water spray hole is formed covering the die length of a radius of the membrane module 53 of the lower part of the piping 56 with a water spray hole. And the common manifold 57 is connected to the upper limit of said piping 56 with a water spray hole. By the way, since said membrane module 53 can be rotated now with the drive which is not illustrated, processed water can be applied to the whole film surface.

[0029] On the other hand, said manifold 57 and the pars basilaris ossis occipitalis of the dipping former membrane-separation tub 31 are connected by Rhine L5. A pump P2 is arranged in this Rhine L5, the processed water of a pars basilaris ossis occipitalis is circulated, the piping 56 with a water spray hole is supplied through a manifold 57, and it is injected by the membrane module 53 from the water spray hole of this piping 56 with a water spray hole. In this case, although fixed, since a membrane module 53 is rotated, the piping 56 with a water spray hole can wash the film surface of this membrane module 53 uniformly.

[0030] Next, the 3rd example of this invention is explained. Drawing 5 is the conceptual diagram of the filtration film washing station in the 3rd example of this invention. In this case, a filtration film washing station is used in the process which performs biological treatment of a heavy load. Therefore, the biological treatment tank 61 and the dipping former membrane-separation tub 31 as a processing tub are connected by Rhine L1 and the water extubation 33, biological treatment is performed in the biological treatment tank 61, and filtration processing and filtration film washing processing are performed in the dipping former membrane-separation tub 31. In this filtration film washing processing, a pump P2 is operated, and the processed water of the pars basilaris ossis occipitalis of the dipping former membrane-separation tub 31 is supplied to spray equipment 35 through Rhine L5, and is injected by the membrane module 41 (drawing 1) of a membrane separation device 32 from this spray equipment 35. And in connection with treated water (biological treatment water) being made to dissociate from processed water in filtration processing, processed water is condensed and this processed water is returned to the biological treatment tank 61 through the water extubation 33. Therefore, high cell mass concentration is maintainable in this biological treatment tank 61. In addition, it is Rhine for setting L6 to the raw water supply line of processed water, setting L7 at the time of filtration, and drawing out some processed water.

[0031] By the way, in order to expose a film surface to a gaseous phase in injecting processed water to a membrane module 41 with said spray equipment 35, the processed water in the dipping former membrane-separation tub 31 is discharged through the water extubation 33. In this case, the water extubation 33 is connected with the biological treatment tank 61, and the discharged processed water is supplied to the biological treatment tank 61. So, it is necessary to secure the empty volume for ****** of the dipping former membrane-separation tank 31 to the biological treatment tank 61. Moreover, in order to supply the discharged processed water to the biological treatment tank 61, a pump P3 is arranged in the water extubation 33.

[0032] Next, actuation of the filtration film washing station of said configuration is explained. First, processed water is supplied to the dipping former membrane-separation tub 31 from the biological treatment tank 61 through Rhine L1, and filtration processing is started. In this filtration processing, only processed underwater treated water penetrates the film of a membrane module 41, and is sent to a treated water side, and impurity, sludge, etc. remain to a film surface. And if processed water is repeated and processed, impurity, sludge, etc. which remained will adhere to a film surface as solids gradually, and will form a cake layer.

[0033] Then, when the treated water obtained with the membrane module 41 turns around an initial complement the bottom, supply of processed water is stopped and filtration film washing processing is started. That is, said pump P3 is operated, the processed water in the dipping former membrane-separation tub 31 is discharged through the water extubation 33, and the biological treatment tank 61 is supplied. And the film surface of a membrane separation device 32 is exposed to a gaseous phase. this time -- a spray -- as service water -- the processed water in the dipping former membrane-separation tub 31 -- constant-rate ****.

[0034] And a pump P2 is operated, the processed water of the pars basilaris ossis occipitalis of the dipping former membrane-separation tub 31 is circulated through Rhine L5, and it injects from spray equipment 35 with high pressure to a membrane module 41. After carrying out fixed time amount injection of the processed water, a pump P2 is stopped, processed water is again supplied to the dipping former membrane-separation tub 31, and filtration processing will be resumed if the water level to which this processed water was set is reached.

[0035] Next, the 4th example of this invention is explained. Drawing 6 is the conceptual diagram of the filtration film washing station in the 4th example of this invention. In this case, a filtration film washing station is used in the condensation process which adds flocculants, such as a ferric chloride, in processed water, and removes a soluble COD component etc. Therefore, the condensation treated water tub 62 and the dipping former membrane-separation tub 31 as a processing tub are connected by Rhine L1 and the water extubation 33, a coagulation treatment is performed in said condensation treated water tub 62, and filtration processing and filtration film washing processing are performed in the dipping former membrane-separation tub 31. In addition, it is Rhine for setting L6 to the raw water supply line of processed water, setting L7 at the time of filtration, and drawing out some processed water.

[0036] Treated water is made to dissociate from processed water in said filtration processing. Moreover, a pump P2 is operated in filtration film washing processing, and the processed water of the pars basilaris ossis occipitalis of the dipping former membrane-separation tub 31 is supplied to spray equipment 35 through Rhine L5, and is injected by the membrane module 41 (drawing 1) of a membrane separation device 32 from this spray equipment 35. Consequently, the suspended solid which remained to the film surface in filtration processing is removable.

[0037] By the way, in order to expose a film surface to a gaseous phase in injecting processed water to a membrane module 41 with said spray equipment 35, the processed water in the dipping former membrane-separation tub 31 is discharged through the water extubation 33. In this case, the water extubation 33 is connected to the condensation treated water tub 62, and the discharged processed water is supplied to the condensation treated

water tub 62. So, it is necessary to secure the empty volume for ****** of the dipping former membrane-separation tank 31 to this condensation treated water tub 62. Moreover, in order to supply the discharged processed water to the condensation treated water tub 62, a pump P3 is arranged in the water extubation 33.

[0038] In addition, this invention is not limited to said example, and it is possible to make it deform variously based on the meaning of this invention, and it does not eliminate these from the range of this invention.

[0039]

[Effect of the Invention] According to this invention, a membrane separation device is immersed in a processing tub, and this membrane separation device is made to separate treated water from processed water in the filtration film washing approach, as explained to the detail above. And only the amount of setup is made to remain, the processed water in said processing tub is discharged, and the membrane module of said membrane separation device is exposed to a gaseous phase. Next, the processed water which remained is taken out from the pars basilaris ossis occipitalis of a processing tub, spray equipment is supplied, and it injects from this spray equipment to a membrane module.

[0040] In this case, since a film surface is exposed to a gaseous phase in case processed water is injected to a membrane module, the momentum which processed water has can be made to act on a direct film surface. Therefore, the solid which was large as for impulse force when processed water hits a film surface, and adhered to the film surface can be made to fully exfoliate. Consequently, a solid is easily removable.

[0041] Moreover, since it is not necessary to process the wash water which it is not necessary not only to use another wash water, but contains the removed solid since processed water is used as an object for washing, cost can be made low. And since the film is not damaged since the compressed air is not used, and a sponge ball is not used, a membrane module can be washed uniformly, and further, since it is not necessary to take out this membrane module from a processing tub, an activity is simplified.

[0042] In case processed water is injected to a membrane module, said spray equipment is made to go up and down along with a film surface in other filtration film washing approaches of this invention. In this case, the injected processed water is applied by the whole membrane module. Therefore, the film surface of this membrane module can be washed uniformly. In the filtration film washing approach of further others of this invention, in case processed water is injected to a membrane module, this membrane module is rotated. In this case, the injected processed water is applied by the whole membrane module. Therefore, the film surface of this membrane module can be washed uniformly.

[0043] In the filtration film washing approach of further others of this invention, while said processing tub and biological treatment tank are connected and processed water is supplied to said processing tub from this biological treatment tank, the processed water discharged from said processing tub is supplied to said biological treatment tank. In this case, treated water can be made to separate from the processed water which biological treatment ended. Therefore, since the condensed processed water can be returned to a biological treatment tank, high cell mass concentration is maintainable in a biological treatment tank.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] In the filtration film washing approach of the waste water treatment equipment into which a membrane separation device is immersed in a processing tub, and treated water is made to separate from processed water with this membrane separation device (a) Make only the amount of setup remain, discharge the processed water in said processing tub, and the membrane module of said membrane separation device is exposed to a gaseous phase. (b) The filtration film washing approach characterized by taking out the processed water which remained from the pars basilaris ossis occipitalis of a processing tub, supplying spray equipment, and injecting from this spray equipment to a membrane module.
[Claim 2] The filtration film washing approach according to claim 1 which said spray equipment is made to go up and down along with a film surface in case processed water is injected to a membrane module.
[Claim 3] The filtration film washing approach according to claim 1 rotated by this membrane module in case processed water is injected to a membrane module.
[Claim 4] (a) The filtration film washing approach according to claim 1 that the processed water discharged from the (c) aforementioned processing tub is supplied to said biological treatment tank while said processing tub and biological treatment tank are connected and processed water is supplied to said processing tub from (b) this biological treatment tank.
[Claim 5] (a) The filtration film washing approach according to claim 1 that the processed water discharged from the (c) aforementioned processing tub is supplied to said condensation treated water tub while said processing tub and a condensation treated water tub are connected and processed water is supplied to said processing tub from (b) this condensation treated water tub.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the detail drawing of the filtration film washing station in the example of this invention.
[Drawing 2] It is drawing showing the conventional air back wash method.
[Drawing 3] It is the conceptual diagram of the filtration film washing station in the 1st example of this invention.
[Drawing 4] It is the detail drawing of the filtration film washing station in the 2nd example of this invention.
[Drawing 5] It is the conceptual diagram of the filtration film washing station in the 3rd example of this invention.
[Drawing 6] It is the conceptual diagram of the filtration film washing station in the 4th example of this invention.
[Description of Notations]
31 Dipping Former Membrane-Separation Tub
32 52 Membrane separation device
35 55 Spray equipment
41 53 Membrane module
61 Biological Treatment Tank
62 Condensation Treated Water Tub

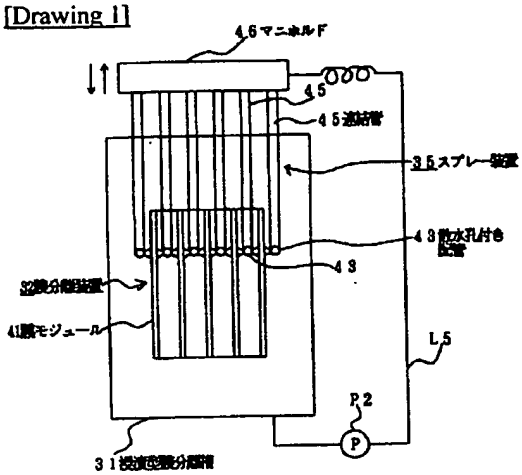
[Translation done.]

* NOTICES *

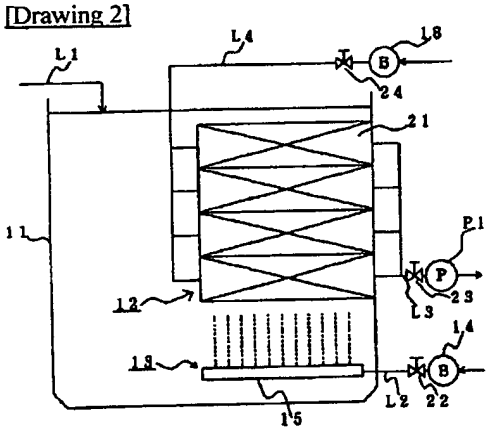
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

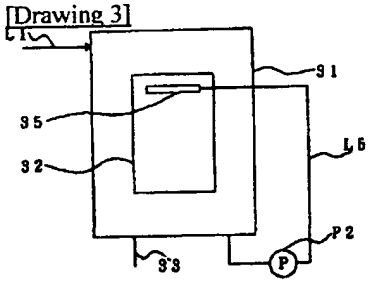
[Drawing 1]



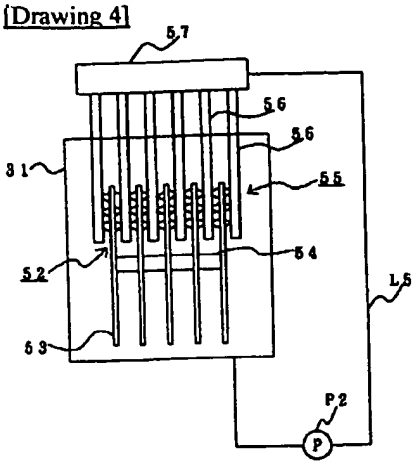
[Drawing 2]



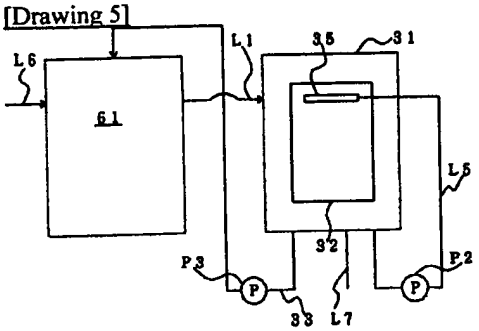
[Drawing 3]



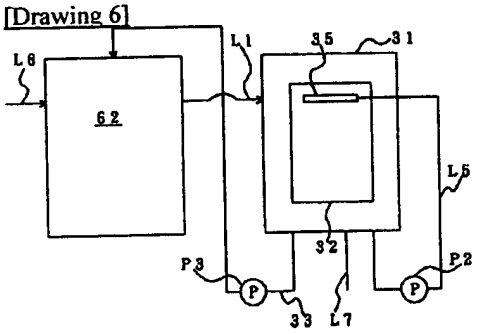
[Drawing 4]



[Drawing 5]



[Drawing 6]



[Translation done.]

[0017]

[Examples]Hereinafter, an embodiment of the present invention is described in detail with reference to the drawings.FIG. 3 is a schematic view of a filter-membrane washing device in a first embodiment of the present invention.In the drawing, 31 is an immersion-type membrane separation tank, serving as a processing tank, to which water to be processed is supplied by way of a line L1.Furthermore, 32 is a membrane separation device, which is immersed in the immersion-type membrane separation tank 31, and which comprises a plurality of flat membrane modules, not shown in the drawing; from the water to be processed, only processed water is fed to the processed-water side by passing through the membrane of the membrane module.

[0018]Furthermore, 33 is a water removal pipe, formed at the bottom of the immersion-type membrane separation tank 31; by operating a valve disposed on this water removal pipe 33, which is not shown in the drawing, it is possible to evacuate the water to be processed from the emersion-type membrane separation tank 31.A spray device 35 is disposed corresponding to each of the membrane modules of the membrane separation device 32; and the bottom of the immersion-type membrane separation tank 31 is connected to this spray device 35 by a line L5.A pump P2 is disposed on this line L5 and the water to be processed at the bottom [of the tank] is circulated by this pump P2 and sprayed onto the membrane module from the spray device 35.

[0019]Next, the operation of a filter-membrane cleaning device having the constitution set forth above is described.First, water to be processed is supplied to the immersion-type membrane separation tank 31 by way of the line L1, and filtration processing begins.In this filtration processing, from the water to be processed, only processed water is fed to the processed-water side by passing through the membrane of the membrane module, and impurities, sludge and the like remain on the surface of the membrane.Then, with repeated processing of water to be processed, remaining impurities, sludge and the like progressively adhere as solids on the surface of the membrane, forming a cake layer.

[0020]Then, when the amount of processed water produced by the membrane module 32 falls below the required amount, supply of the water to be processed is stopped and filter-membrane cleaning operations begin.Specifically, the valve is operated so that the water to be processed is evacuated from the immersion-type membrane separation tank 31 by way of the water removal pipe 33, and the membrane

surface of the membrane separation device 32 is exposed to the gas phase.At this point, a certain amount of water to be processed is left in the immersion-type membrane separation tank 31 as spray water.

[0021]Then, the pump P2 is operated and the water to be processed at the bottom [of the tank] is circulated by way of the line L5 and sprayed against the membrane module at high pressure from the spray device 35.After spraying the water to be processed for a certain amount of time, water to be processed is once again supplied to the immersion-type membrane separation tank 31 and, when the water to be processed reaches the set water level, filtration operations are recommenced.In this case, when the water to be processed is sprayed against the membrane module, the membrane surface is exposed to the gas phase, and therefore the momentum of the water to be processed can act directly on the membrane surface.Accordingly, the impact force of the water to be processed that strikes the membrane surface is large, so that it is possible to fully detach the solids that have adhered to the membrane surface.Consequently, the solids can easily be removed.

[0022] Furthermore, since water to be processed is used for cleaning, not only is it unnecessary to use separate cleaning water, but there is no need to process cleaning water containing solids that have been removed, which allows for cost reductions.Furthermore, as compressed air is not used, the membrane is not damaged; as sponge balls are not used, the membrane module can be uniformly cleaned; and as it is not necessary to remove the membrane module from the immersion-type membrane separation tank, work is simplified.